

VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN
ELAYAMPALAYAM, TIRUCHENGODE (Tk.), NAMAKKAL (Dt.).

(An ISO 9001 : 2008 Institutions Affiliated to Periyar University,
Approved by AICTE & Re-accredited with 'A+' Grade by
NAAC) Recognized under section 2(f) & 12(b) of UGC Act,
1956



PG & RESEARCH DEPARTMENT OF
COMPUTER SCIENCE AND APPLICATIONS

B.Sc., DATA SCIENCE

SYLLABUS & REGULATIONS

FOR CANDIDATES ADMITTED FROM 2022 - 2023
ONWARDS UNDER AUTONOMOUS & CBCS & OBE PATTERN

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VIVEKANANDHA EDUCATIONAL INSTITUTIONS
Angammal Educational Trust
Elayampalayam, Tiruchengode (Tk.), Namakkal (Dt.)

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)**

B.Sc., in Data Science

(BACHALOROF SCIENCE IN DATA SCIENCE)

(Candidates admitted from 2022-2023 onwards)

REGULATIONS

I. SCOPE OF THE PROGRAMME

Bachelor of Data Science can be considered to be one of the most prominent UG level programs in our country. This program mainly deals with the development of Computer Science for the purpose of updating computer programming languages. Data Science combines the magic of programming, mathematics and business. The course has a time period of 3 years with 6 semesters.

II. SALIENT FEATURES

- ❖ Regular conduct of guest lectures and seminars
- ❖ Campus recruitment
- ❖ Provides facilities such as Internet Access and In-House Library
- ❖ Provides Career Guidance for Post Graduate Courses like M.Sc, and the Certifications in programming languages
- ❖ Conduct of Personality Development Program
- ❖ Visiting Faculties from Industries

III. OBJECTIVES OF THE PROGRAMME

- ❖ Train graduates to perform and conduct data-driven investigations by managing and visualizing all types of data.
- ❖ Understand the concept and develop an in-depth understanding of data science and data analytics.
- ❖ To analyze quantitative and qualitative data, identify effective patterns and predict upcoming trends.
- ❖ Teach advanced techniques and procedures in obtaining actionable or meaningful insights from raw data sets.
- ❖ Extract meaningful insights and useful information to businesses to strategize and generate more revenues.
- ❖ Incorporate with advanced data science fields and their applications to deliver solutions.

IV. ELIGIBILITY FOR ADMISSION

A Candidates seeking admission to the first year Degree course (B.Sc. Data Science) shall be required to have passed Higher Secondary Examination with Mathematics or Computer Science) as one of the subject under Higher Secondary Board of Examination, conducted by the Government of Tamilnadu or an examination accepted as equivalent thereto by the syndicate, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the B.Sc. Data Science Degree Examination of Periyar University after a course of study of three academic years.

V. **DURATION OF THE PROGRAMME**

- ❖ The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to April.
- ❖ The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University.

VI. **CONTINUOUS INTERNAL ASSESSMENT (CIA)**

The performance of the students will be assessed continuously and the Internal Assessment

Marks **FOR THEORY PAPERS** will be as under:

1	Average of Two Tests	-	05
2	Model Exam	-	10
3	Assignment	-	05
4	Attendance	-	05
Total		-	25

Assessment Marks **FOR PRACTICAL PAPERS** will be as under:

1	Model Exam	-	20
2	Observation Note	-	10
3	Attendance	-	10
Total			40

PASSING MINIMUM - EXTERNAL

THEORY	In the End Semester Examinations, the passing minimum shall be 40% out of 75 Marks. (30 Marks)
PRACTICAL / MAJOR PROJECT	In the End Semester Examinations, the passing minimum shall be 40% out of 60 Marks. (24 Marks)

VII. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on learning 75 % of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

VIII. DISTRIBUTION OF MARKS FOR ATTENDANCE

ATTENDANCE PERCENTAGE	MARKS	
	THEORY	PRACTICAL
75-80	1	2
81-85	2	4
86-90	3	6
91-95	4	8
96-100	5	10

IX. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the Examination of Core Courses (Main & Allied Subjects) & Securing Marks.

- a) 75% and above shall be declared to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
- b) 60% and above but below 75% shall be declared to have passed the Examinations in First Class.
- c) 50% & above but below 60% shall be declared to have passed the examinations in Second Class.
- d) All the remaining successful candidates shall be declared to have passed the examinations in Third Class.
- e) Candidates who pass all the examinations prescribed for the course at the First appearance itself and within a period of three Consecutive Academic years from the year of admission only will be eligible for University Rank.

X. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the Degree only if she has undergone the above Degree for a period of not less than Three Academic years comprising of six semesters and passed the Examinations prescribed and fulfilled such conditions has have been prescribedtherefore.

XI. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the university examination in the concerned subject in subsequent semesters and shall pass the examination.

XII. COMMENCEMENT OF REGULATIONS

These regulations shall take effect from the academic year 2022-2023 (i.e.,) for the students who are to be admitted to the First year of the course during the Academic year 2022- 23 and thereafter.

XIII. TRANSITORY PROVISIONS

Candidates who were admitted to the UG course of study before 2018-2019 shall be permitted to appear for the examinations under those regulations for the period of Three yearsie., upto and inclusive of the Examinations of 2021-2022. Thereafter, they will be permitted to appear for the examinations only under the regulations then in force.

XIV. EVALUATION OF EXTERNAL EXAMINATIONS (EE)

<u>QUESTION PAPER PATTERN – THEORY</u>	
Time duration: 3 Hours	
Max. Marks: 75	
PART- A: (20 x 1= 20)	Answer all the Questions Four Questions from each Unit
PART- B: (5 x 5 = 25)	Answer all the questions One Question from each Unit (Either or Type)
PART- C: (3 x 10 = 30)	Answer any THREE of the questions One Question from each Unit (3 Out of 5)
In The End Semester Examinations, The Passing Minimum Shall Be 40% Out of 75 Marks. (30 Marks)	

<u>QUESTION PAPER PATTERN – PRACTICAL</u>	
Time duration: 3 Hours	
Max. Marks: 60	
1. One compulsory question from the given list of objectives	30 Marks
2. One either/or type question from the given list of objectives	30 Marks
IN THE END SEMESTER EXAMINATIONS, THE PASSING MINIMUM SHALL BE 40% OUT OF 60MARKS. (24 MARKS)	

B.Sc., DATA SCIENCE

CURRICULUM ACADEMIC YEAR 2023 – 2024

**COURSE PATTERN AND SCHEME OF EXAMINATIONS
UNDER AUTONOMOUS, CBCS & OBE PATTERN**

FOR THE CANDIDATES ADMITTED FROM THE YEAR 2022 – 2023 ONWARDS

SEMESTER: III & IV



SEM	Part	Course Code	COURSE TITLE	Hrs	CRE DIT	MARKS		
						CIA	EE	TOT
III	I	22U3LT03	Foundation Tamil – III	5	3	25	75	100
	III	22U3DSC04	Programming in Python	4	4	25	75	100
	III	22U3DSCP04	Programming in Python Lab	3	2	40	60	100
	III	22U3DSC05	Introduction to Data Science	5	4	25	75	100
	III	22U3DSCP05	Data Science with R Lab	3	3	40	60	100
	III	22U3MAA03	Statistical Methods and Their Applications-I	4	4	25	75	100
	IV	22U3DSS01	SBEC-I	2	2	25	75	100
	IV		NMEC-I	2	2	25	75	100
			Library & Sports	2	-	-	-	-
			Total	30	24	230	570	800
IV	I	22U4LT04	Foundation Tamil – IV	5	3	25	75	100
	III	22U4DSC06	Machine Learning	4	4	25	75	100
	III	22U4DSC07	Relational DataBase Management Systems	4	4	25	75	100
	III	22U4DSCP06	SQL AND PL/SQL Lab	3	2	40	60	100
	III	22U4DSC08	Web Technology	4	3	25	75	100
	III	22U4MAA04	Statistical Methods and Their Applications-II	4	4	25	75	100
		22U4DSS02	SBEC-II	2	2	25	75	100
	IV		NMEC-II	2	2	25	75	100
			Library & Sports	2	-	-	-	-
			Total	30	24	230	570	800

SEMESTER: V & VI

SEM	Part	COURSE CODE	COURSE TITLE	Hrs	CRE DIT	MARKS		
						CIA	EE	TOT
V	III	22U5DSC09	Data Mining	4	4	25	75	100
	III	22U5DSCP07	Data Mining Lab	4	2	40	60	100
	III	22U5DSC10	Data Visualization Techniques	4	4	25	75	100
	III	22U5DSCP08	Data Visualization Lab	4	2	40	60	100
	III	22U5DSC11	Computer Networks	5	4	25	75	100
	III	22U5DSE__	ELECTIVE-I	5	3	25	75	100
	IV	22U5DSS03	SBEC-III	2	2	25	75	100
			Library & Sports	2	-	-	-	-
			Total	30	21	205	495	700
VI	III	22U6DSC12	Modern Database Systems	4	4	25	75	100
	III	22U6DSCP09	Modern Database Systems Lab	4	2	40	60	100
	III	22U6DSC13	Deep Learning	4	4	25	75	100
	III	22U6DSCP10	Deep Learning Lab	4	2	40	60	100
	III	22U6DSCP01	Project	5	3	40	60	100
	III	22U6DSE__	Elective-II	5	4	25	75	100
	IV	22U6DSS04	SBEC-IV	2	2	25	75	100
	V		Extension Activities	-	1	-	-	-
			Library & Sports	2	-	-	-	-
		Total	30	22	220	480	700	
			Grand Total	180	140	1330	3270	4600

SKILL BASED ELECTIVE COURSES (SBEC)		
Semester	Course Code	Course Name
III	22U3DSS01	SYSTEM ADMINISTRATION AND MAINTENANCE
IV	22U4DSS02	CYBER SECURITY
V	22U5DSS03	WIRELESS NETWORKS
VI	22U6DSS04	DIGITAL MARKETING

CORE ELECTIVES		
Semester	Course Code	Course Name
ELECTIVE – I		
V	22U5DSE01	CLOUD COMPUTING
	22U5DSE02	BIG DATA ANALYTICS
	22U5DSE03	SOFTWARE ENGINEERING
ELECTIVE – II		
VI	22U6DSE04	PREDICTIVE ANALYSIS
	22U6DSE05	OPERATING SYSTEM
	22U6DSE06	INTERNET OF THINGS

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.				 ISO 9001:2008 www.tv.com ID 9105074497				
Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023			
Department	Data Science		Semester			III			
Course Code	Course Name		Periods per Week		Credit		Maximum Marks		
			L	T	P	C	CA	ESE	Total
22U3DSC04	Programming in Python		4	0	0	4	25	75	100
COURSE OBJECTIVE S	To learn a dynamic, interpreted (Byte Code-Compiled) and high level programming language. Toknow the basics of algorithmic problem solving. To use Python data structures -- lists, tuples, dictionaries.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas iscience and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	To read and write simple Python programs.
CO 2	To define Python functions and call them.
CO 3	To develop Python programs with conditionals and loops.
CO 4	To do input/output with files in Python and develop GUI based programs
CO 5	To develop knowledge for data analysis by using Python
Pre-requisites	Know about Programming Languages

Knowledge Levels							
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing							
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)							
COs	KLs	POs	KLs				
CO 1	2	PO 1	1				
		PO 2	2				
		PO 3	6				
CO 2	1	PO 4	5				
		PO 5	3				
		PO 6	5				
CO 3	3	PO 7	4				
CO 4	4						
CO 5	5						
COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	1	1	2	1	1
CO2	3	2	1	1	1	1	1
CO3	1	2	1	1	3	1	2
CO4	1	1	1	2	2	2	1
CO5	1	1	2	3	1	3	2

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction to Python	Periods	12
	Introduction to Python - Why Python - Installing in various Operating Systems - Executing Python Programs - Basic Programming concepts - Variables, expressions and statements - Input/ Output - Operators.		
Unit - II	Conditions-Structures	Periods	12
	Conditions - Functions - Arguments - Return values - Iteration - Loops - Strings -Data Structures - Lists - Dictionaries - Tuples - Sequences - Exception Handling.		
Unit - III	File Handling-Introduction to MySQL	Periods	12
	File Handling - Modules - Regular Expressions - Text handling - Object Oriented Programming - Classes - Objects - Inheritance - Overloading - Polymorphism Interacting with Databases - Introduction to MySQL -interacting with MySQL - Building a address book with add/edit/delete/search features.		
Unit - IV	Introduction to Graphics programming	Periods	12
	Introduction to Graphics programming - Introduction to GTK - PyGTK - Developing GUI applications using pyGTK - Scientific Programming using NumPy / SciPy - Image Processing - Processing multimedia files -Network Programming, Web services using SOAP, Introduction to Graphics programming - PyGame		
Unit - V	Introduction to Version Control Systems	Periods	12
	Introduction to Version Control Systems - Subversion/Git, Writing Unit Tests, Creating Documentation, Contributing to Open Source Projects		
Total Periods			60

Text Books	
1	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 1st Edition 2012, Oâ€™Reilly.
References	
1	Jeff McNeil, "Python 2.6 Text Processing: Beginners Guide", 2010, Packet Publications
2	Mark Pilgrim, "Dive Into Python", 2nd edition 2009, Apress
E-References	
1	https://www.geeksforgeeks.org/extract-all-the-urls-from-the-webpage-using-python/
2	https://www.javatpoint.com/how-to-open-url-in-python
3	https://www.oreilly.com/library/view/programming-python-second/0596000855/ch04s03.html



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Elayampalayam, Tiruchengode-637 205.



Programme	B.Sc	Programme Code	UDS			Regulations	2022-2023		
Department	Data Science		Semester				III		
Course Code	CourseName		Periods per Week		Credit	Maximum Marks			
			L	T	P	C	CA	ESE	Total
22U3DSCP04	Programming in Python Lab		0	0	3	2	40	60	100

List of Experiments

1	Create a simple calculator to do all the arithmetic operations
2	Write a program to use control flow tools like if.
3	Write a program to use for loop
4	Create new module for mathematical operations and use in your program
5	Write a program to read and write files.
6	Write a program with exception handling.
7	Write a program to create and delete directories.
8	Data structures use list as stack, use list as queue, tuple, sequence
9	Write a program using classes
10	Connect with MySQL and create address book



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

Elayampalayam, Tiruchengode-637 205.



Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023				
Department	Data Science		Semester			III			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
22U3DSC05	Introduction to Data Science		5	0	0	4	25	75	100
COURSE OBJECTIVES	Data Science enables companies to efficiently understand gigantic data from multiple sources and derive valuable insights to make smarter data-driven decisions. Data Science is widely used in various industry domains, including marketing, healthcare,								
Pos	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	Understand the fundamental concepts of data science.
CO 2	Evaluate the data analysis techniques for applications handling large data and demonstrate the data science process.
CO 3	Understand concept of machine learning used in the data science process.
CO 4	Visualize and present the inference using various tools.
CO 5	Learn to think through the ethics surrounding privacy, data sharing.
Pre-requisites	Modeling. Mathematical models enable you to make quick calculations and predictions based on what you already know about the data. Statistics. Statistics are at the core of data science

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	1
		PO 3	1
CO 2	1	PO 4	1
		PO 5	1
		PO 6	1
CO 3	1	PO 7	1
CO 4	1		
CO 5	1		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	3	3	1
CO2	3	3	3	3	3	3	1
CO3	3	3	3	3	3	3	1
CO4	3	3	3	3	3	3	1
CO5	3	3	3	3	3	3	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Data Evolution	Periods	12
	Data to Data Science - Understanding data: Introduction -Type of Data, Data Evolution - Data Sources. Preparing and gathering data and knowledge - Philosophies of data science.		
Unit - II	Data all around us	Periods	12
	The virtual wilderness - Data wrangling: From capture to domestication - Data science in a big data world - Benefits and uses of data science and big data - facets of data.		
Unit - III	Digital Data-An Imprint	Periods	12
	Introduction to Big Data: - Evolution of Big Data - What is Big Data - Sources of Big Data. Characteristics of Big Data 6Vs - Big Data - Challenges of Conventional Systems - Data Processing Models -Limitation of Conventional Data Processing Approaches - Big Data.		
Unit - IV	Machine learning	Periods	12
	Modelling Process - Training model - Validating model - Predicting new observations -Supervised learning, Unsupervised learning, Semi supervised learning. Exploratory data analysis.First steps in big data: -Distributing data storage and processing with Frameworks		
Unit - V	Ethics and Data Science	Periods	12
	Doing Good Data Science, The Five Cs,Implementing the Five Cs, Ethics and Security Training, Building Ethics into a Data-Driven Culture, Regulation, Building Our Future.		
Total Periods			60

Text Books	
1	Davy Cielen, Arno D. B. Meysman and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. • Brian Godsey, "Think Like a Data Scientist", Manning Publications, 2017. • Mike Loukides, Hilary Mason & D J Patil, "Ethics and Data Science", Oâ€™Reilly, 1st Ed, 2018. • Davy Cielen, Arno D.B.Meysman, Mohamed Ali, "Introducing Data Science", 2016. • Reema Thareja, "Data Science and Machine Learning with R", 2021. • Luca Massaron John Paul Mueller, "Python for Data Science", 2nd Ed, 2019.
References	
1	Brian Godsey, "Think Like a Data Scientist", Manning Publications, 2017.
2	Mike Loukides, Hilary Mason & D J Patil, "Ethics and Data Science", Oâ€™Reilly, 1st Ed, 2018.
3	Davy Cielen, Arno D.B.Meysman, Mohamed Ali, "Introducing Data Science", 2016.
4	Reema Thareja, "Data Science and Machine Learning with R", 2021
5	Luca Massaron John Paul Mueller, "Python for Data Science", 2nd Ed, 2019.

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	Programme	B.Sc	Programme Code	UDS	Regulations		2022-2023		
Department	Data Science		Semester			III			
Course Code	CourseName		Periods per Week			Credit		Maximum Marks	
			L	T	P	C	CA	ESE	Total
22U3DSCP05	DATA SCIENCE WITH R LAB		0	0	3	3	40	60	100
List of Experiments									
1	Installing R and R Studio								
2	Applying Simple Commands in R								
3	R as a Calculator application								
4	Execution of Loops and Functions via R - Control Structures								
5	Basic Descriptive Statistics using <i>summary ()</i> – <i>sapply()</i> – <i>describe()</i> – <i>stat.desc()</i> – by group using <i>Aggregate ()</i> in R								



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Elayampalayam, Tiruchengode-637 205.

Programme	B.Sc	Programme Code	UDS			Regulations	2022-2023		
Department	Data Science		Semester				IV		
Course Code	Course Name		Periods per Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
22U4DSC06	MACHINE LEARNING		4	0	0	4	25	75	100
COURSE OBJECTIVES	The objective of the course is To understand the basic theory underlying machine learning. To be able to formulate machine learning problems corresponding to different applications. To understand a range of machine learning								
Pos	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								



COs	COURSE OUTCOME
CO 1	Appreciate the importance of visualization in the data analytics solution
CO 2	Apply structured thinking to unstructured problems
CO 3	Understand a very broad collection of machinelearning algorithms and problems
CO 4	Learn algorithmic topics of machine learning andmathematically deep enough to introduce the Requiredtheory
CO 5	Develop an appreciation for what is involved inlearning from data
Pre-requisites	Algebra.Linear algebra.Trigonometry.Statistics.Calculus (optional, for advanced topics)Python Programming.Bash Terminal / Cloud Console.

Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	1
		PO 3	1
CO 2	1	PO 4	1
		PO 5	1
		PO 6	1
CO 3	1	PO 7	1
CO 4	1		
CO 5	1		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	3	3	1
CO2	3	3	3	3	3	3	1
CO3	3	3	3	3	3	3	1
CO4	3	3	3	3	3	3	1
CO5	3	3	3	3	3	3	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction to machine learning	Periods	12
	Introduction, Types of machine learning, Applications of Machine Learning, Perspectives and issues in machine learning, Tools in machine learning, basic types of data in machine learning, exploring structure of data, data preprocessing. Performance metrics - accuracy, precision, recall, sensitivity, specificity, AUC, RoC, Bias Variance decomposition.		
Unit - II	Probabilistic and Stochastic Models:	Periods	12
	Bayesian Learning - Bayes theorem, Concept learning, Maximum likelihood, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Expectation maximization and Gaussian Mixture Models, Hidden Markov models.		
Unit - III	Supervised learning	Periods	12
	Introduction, Regression, Linear regression, Classification: Decision trees, k-Nearest Neighbours, Support Vector Machine, Logistic regression, Naïve Bayes, Random Forest. Artificial Neural Network: Introduction, Perceptrons, multi-layer networks and backpropagation.		
Unit - IV	Unsupervised learning	Periods	12
	Introduction, Supervised vs Unsupervised Cluster Analysis, K-means clustering, Hierarchical clustering. Dimension reduction: Principal Component Analysis, Linear Discriminant Analysis		
Unit - V	Modelling, evaluation and Genetic algorithms	Periods	12
	Building the model, Training a model, evaluating a model, improving a model. Genetic Algorithms - Representing hypothesis, Genetic operators and Fitness function and selection, Simple applications of the Genetic Algorithm.		
Total Periods			60
Text Books			
1	Saikat Dutt Subramanian Chandramouli Amit Kumar Das Machine Learning Pearson Education		
References			
1	T Hastie R Tibshirani and J Friedman Elements of Statistical Learning		
E-References			
1	www.geeksforgeeks.org/machinelearning		

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	Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023		
Department	Data Science		Semester			IV		
Course Code	Course Name	Periods per Week		Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total
22U4DSC07	Relational Data Base Management Systems	4	0	0	4	25	75	100
COURSE OBJECTIVES	The main objective of this course is to enable students to the fundamental concepts of database analysis and design							
POs	PROGRAMME OUTCOME							
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas of science and multidisciplinary fields							
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements							
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science							
PO 4	Communicate the subject effectively.							
PO 5	Understand professional, ethical, and social responsibilities.							
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions							
PO 7	Imbibe Quality Software Development practices.							

COs	COURSE OUTCOME
CO 1	Understand the basic principles of database management systems
CO 2	Draw Entity-Relationship diagrams to represent simple database applicationscenarios
CO 3	write SQL queries for a given context in relational database
CO 4	Discuss normalization techniques with simple examples.
CO 5	Describe transaction processing and concurrency control concepts
Pre-requisites	Discrete Structures

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	2	PO 1	2
		PO 2	1
		PO 3	4
CO 2	2	PO 4	2
		PO 5	2
		PO 6	3
CO 3	1	PO 7	4
CO 4	4		
CO 5	3		



COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	3	3	2	1
CO2	3	2	1	3	3	2	1
CO3	2	3	1	2	2	1	1
CO4	1	1	3	1	1	2	1
CO5	2	1	2	2	2	3	2

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction	Periods	12
	Introduction: Database System Applications-DBMS Vs. File System - View of Data-Data Model Database Languages - Database users and Administrators - Transaction Management - Database System Structure - Application Architecture. Data Models: Basic Concepts - Constraint- Keys- ER Diagram - Weak Entity - Extended ER Features - UML; Relational Model: Structure of Relational Databases - Relational Algebra - Views.		
Unit - II	SQL	Periods	12
	Background-Basic Structure-Set Operation-Aggregate Function-Null Values-Nested Sub Queries - Views - Modification of the Database - Data Definition Language - Embedded SQL - Dynamic SQL		
Unit - III	Advance SQL	Periods	12
	Integrity and Security: Domain - Constraint - Referential Integrity - assertions - Triggers - Security and Authorization - Authorization in SQL - Encryption and Authentication		
Unit - IV	Relational Database Design	Periods	12
	First Normal Form - Pitfalls in Relational Database Design-Functional Dependencies (Second Normal Form) - Boyce-Codd Normal Form - Third Normal Form - Fourth Normal Form - Overall Database Design Process		
Unit - V	Transaction Management	Periods	12
	Transaction concepts - States - Serializability. Lock based concurrency control: Locks - Granting - Two-Phase Locking protocol. Time stamp based protocol: Timestamps - Timestamp ordering protocol -Dead lock handling.		
Total Periods			60

Text Books	
1	A Silberschatz H Korth S Sudarshan Database System and Concepts 5th Edition McGraw Hill 2005
References	
1	Alexis Leon Mathews Leon Essential of DBMS 2nd reprint Vijay Nicole Publications 2009
2	Alexis Leon Mathews Leon Fundamentals of DBMS 2nd Edition Vijay Nicole Publications 2014
E-References	
1	https://www.techtarget.com/searchdatamanagement/definition/database-management-system

		VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023			
Department	Data Science		Semester			IV			
Course Code	CourseName	Periods per Week			Credit			Maximum Marks	
		L	T	P	C	CA	ESE	Total	
22U4DSCP06	SQL AND PL/SQL LAB	0	0	3	2	40	60	100	
List of Experiments: Demonstrate the following SQL commands and can take any back-endRDBMSsystem for implementation purpose.									
1	Data Definition of Base Tables.								
2	DDL with Primary key constraints								
3	DDL with constraints and verification by insert command								
4	Data Manipulation of Base Tables and Views								
5	Demonstrate the Query commands								
6	Write a PL/SQL code block that will accept an account number from the user and debit an amount of Rs. 2000 from the account if the account has a minimum balance of 500after theamount is debited. The Process is to fired on the Accounts table.								
7	Write a PL/SQL code block to calculate the area of the circle for a value of radius varying from3 to 7.Store the radius and the corresponding values of calculated area in a table Areas. Areas – radius, area.								

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)										
Programme		B.Sc	Programme Code		UDS			Regulations		2022-2023	
Department		Data Science			Semester				IV		
Course Code		Course Name			Periods per Week		Credit		Maximum Marks		
					L	T	P	C	CA	ESE	Total
22U4DSC08		WEB TECHNOLOGY			4	0	0	3	25	75	100
COURSE OBJECTIVES		To acquire knowledge on script editor, create a web page, design simple web pages with various tags									
POs		PROGRAMME OUTCOME									
PO 1		Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.									
PO 2		Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.									
PO 3		Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science									
PO 4		Communicate the subject effectively.									
PO 5		Understand professional, ethical, and social responsibilities.									
PO 6		Ability to understand and analyse a given real-time problems and propose feasible computing solutions.									
PO 7		Imbibe Quality Software Development practices.									

COs	COURSE OUTCOME
CO 1	Study the various HTML tags and design simple web pages
CO 2	Knowledge of scripting language with Java Script
Pre-requisites	Basic knowledge of scripting Language



Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	3
		PO 5	3
		PO 6	4
CO 3	3	PO 7	4
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	2	2	1	1
CO3	1	2	3	3	3	2	2
CO4	1	1	2	2	2	3	1
CO5	1	1	1	1	1	2	2

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction	Periods	12
	Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups. Links and Navigation: Basic Links, Creating Links with the <a> Element, Advanced E- mail Links. Images, Audio, and Video: Adding Images Using the Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages.		
Unit - II	Tables:	Periods	12
	Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables. Forms: Introducing Forms, Form Controls, Sending Form Data to the Server. Frames: Introducing Frameset, <frame> Element, Creating Links Between Frames, Setting a Default Target Frame Using <base> Element, Nested Framesets, Inline or Floating Frames with <iframe>.		
Unit - III	Cascading Style Sheets:	Periods	12
	Introducing CSS, Where you can Add CSS Rules. CSS Properties: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model. More Cascading Style Sheets: Links, Lists, Tables, Outlines, The :focus and :activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout wit, Page Layout CSS , Design Issues.		
Unit - IV	Java Script:	Periods	12
	How to Add Script to Your Pages, Variables and Data Types – Statements and Operators, Control Structures, Conditional Statements, Loop Statements – Functions - Message box, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes.		
Unit - V	Working with JavaScript:	Periods	12
	Practical Tips for Writing Scripts, JavaScript Objects: Window Object - Document object - Browser Object - Form Object - Navigator object Screen object - Events, Event Handlers, Forms – Validations, Form Enhancements, JavaScript Libraries.		
Total Periods			60

Text Books	
1	Jon Duckett, Beginning HTML, XHTML, CSS and Java script , Wiley Publishing
References	
1	Chris Bates, “Web Programming”, Wiley Publishing 3d Edition.
2	M. Srinivasan, “Web Technology: Theory and Practice”, Pearson Publication
E-References	
1	https://ptgmedia.pearsoncmg.com/images/9780735623026/Web Technology.pdf
2	https://www.dit.ie/media/ittraining/msoffice/HTML_Core.pdf
3	https://ptgmedia.pearsoncmg.com/images/9780735697799/samplepages/9780735697799.pdf 2010

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)								
Elayampalayam, Tiruchengode-637 205.									
Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023			
Department	Data Science		Semester			V			
Course Code	Course Name		Periods per Week		Maximum Marks				
			L	T	P	C			
22U5DSC09	Data Mining		4	0	0	4	25	75	100
COURSE OBJECTIVE S	Data mining has opened a world of possibilities for business. This field of computational statistics compares millions of isolated pieces of data and is used by companies to detect and predict consumer behaviour.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas of science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively								
PO 5	Understand professional, ethical, and social responsibilities								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices								

COs	COURSE OUTCOME
CO 1	In data mining tasks like data characterization and classification, statistical models of target classes can be built.
CO 2	statistical models can be the outcome of a data mining task.
CO 3	Data mining tasks can be built on top of statistical models.
CO 4	Data mining has opened a world of possibilities for business
CO 5	This field of computational statistics compares millions of isolated pieces of data and is used by companies to detect and predict consumer behaviour.
Pre-requisites	RELATIONAL.Linear Algebra.statistical analysisDatabase and data retrievalAlgorithms and data structuresArtificial intelligenceProblem-solving ability

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	2	PO 1	1
		PO 2	3
		PO 3	2
CO 2	1	PO 4	3
		PO 5	4
		PO 6	5
CO 3	3	PO 7	6
CO 4	4		
CO 5	6		



COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	3	2	1	1	1
CO2	3	1	2	1	1	1	1
CO3	1	3	2	3	2	1	1
CO4	1	2	1	2	3	2	1
CO5	1	1	1	1	1	2	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction	Periods	12
	Data mining application - data mining techniques - data mining case studies- the future of data mining - data mining software - Association rules mining: basics- task and a naïve algorithm- Apriori algorithm -improve the efficient of the Apriori algorithm - mining frequent pattern without candidategeneration (FP-growth) - performance evaluation of algorithms.		
Unit - II	Classification	Periods	12
	Introduction - decision tree - over fitting and pruning - DT rules- Naive bayes method- estimation predictive accuracy of classification methods - other evaluation criteria forclassification method - classificationsoftware.		
Unit - III	Cluster analysis	Periods	12
	cluster analysis - types of data - computing distances-types of cluster analysis methods- partitioned methods - hierarchical methods - density based methods - dealing with large databases - quality and validity ofcluster analysis methods -cluster analysis software.		
Unit - IV	Web data mining	Periods	12
	Introduction- web terminology and characteristics- locality and hierarchy in the web- web content mining-web usage mining- web structure mining - web mining software - Search engines: Search enginesfunctionality- searchengines architecture - ranking of web pages.		
Unit - V	Data warehousing	Periods	12
	Introduction - Operational data sources- data warehousing - Data warehousing design - Guidelines for datawarehousing implementation - Data warehousing metadata - Online analytical processing (OLAP): Introduction - OLAP characteristics of OLAP system - Multidimensional view and data cube - Data cube implementation - Data cube operationsOLAP implementation guidelines.		
Total Periods			60

Text Books	
1	G K Gupta Introduction to Data mining with case studiesâ€– 2nd Edition PHI Private limited New Delhi 2011
References	
1	Arun K Pujari Data Mining Techniquesâ€– 10th impression University Press 2008
E-References	
1	https://nptel.ac.in/courses/106105174/
2	http://cecs.louisville.edu/datamining/PDF/0471228524.pdf

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
	Programme	B.Sc	Programme Code	UDS	Regulations		2022-2023		
Department	Data Science		Semester			V			
Course Code	Course Name		Periods per Week			Credit		Maximum Marks	
			L	T	P	C	CA	ES E	Total
22U5DSCP07	DATA MINING LAB		0	0	4	2	40	60	100
List of Experiments									
1	Demonstrate Categorical (or nominal) attributes and the real-valued attributes.								
2	Create an Employee Table with the help of Data Mining Tool WEKA.								
3	Apply Pre-Processing techniques to the training data set of Employee Table.								
4	Perform the statistical analysis of data								
5	Demonstration of association rule mining using APriori algorithm on supermarketdata.								
6	Perform the classification by decision tree induction.								
7	Create a Decision Tree, train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.								
8	Load the sample dataset and run the ID3 classification algorithm.								

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
	Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023			
Department	Computer Science		Semester			V			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
22U5DSC10	Data Visualization Techniques	4	0	0	4	25	75	100	
COURSE OBJECTIVES	The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets. The term is often used interchangeably with others, including information graphics, information visualization and statistical graph								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas of science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								



COs	COURSE OUTCOME
CO 1	Design and create data visualizations.
CO 2	Conduct exploratory data analysis using visualization.
CO 3	Craft visual presentations of data for effective communication.
CO 4	Use knowledge of perception and cognition to evaluate visualization design alternatives.
CO 5	Data visualization allows business users to gain insight into their vast amounts of data.
Pre-requisites	Well-versed in SQL, Excel and basic programming languages like Python/R etc. Moderate/Expert level knowledge in creating presentations. Data analysis and handling skills.

Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	2
		PO 2	1
		PO 3	3
CO 2	3	PO 4	4
		PO 5	5
		PO 6	6
CO 3	2	PO 7	5
CO 4	5		
CO 5	4		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	1	1	1	1	1
CO2	2	1	3	2	1	1	1
CO3	3	2	2	1	1	1	1
CO4	1	1	1	2	3	2	1
CO5	1	1	2	3	2	1	2

Course Assessment Methods			
Direct			
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations			
Indirect			
1. Course End Delivery			
Content of the Syllabus			
Unit - I	Introduction to Data Visualization	Periods	12
	Why Data Visualization? What Can You Believe? Some Pictures Are More Persuasive, Different Shades of the Truth invisualization, Start Sketching Your Data Story, Recommended Tools for data visualization and demonstration of Tools.		
Unit - II	Data Management for data visualization	Periods	12
	Select Your Spreadsheet Tools, Download to CSV or ODS Format, Make a Copy of a Google Sheet, Share Your Google Sheets, Upload and Convert to Google Sheets, Geocode Addresses in Google Sheets, Collect Data with Google Forms, Sort and Filter Data, Calculate with Formulas, Summarize Data with Pivot Tables Match Columns with VLOOKUP, Spreadsheet Versus Relational Database		
	Data sources and Data processing for data visualization	Periods	12
Unit - III	Open Data Repositories, Source Your Data, Recognize Bad Data Smart Cleanup with Google Sheets, Find and Replace with Blank, Transpose Rows and Columns, Split Data into Separate Columns, Combine Data into One Column, souringdata and processing data for Banking data, Retail data and Healthcare data.		
	Advanced Data processing and Basic Charting	Periods	12
Unit - IV	Extract Tables from PDFs with Tabula, Clean Data with OpenRefine, Set Up OpenRefine, Load Data and Start a New Project, Convert Dollar Amounts from Text to Numbers, Cluster Similar Spellings Precisely Describe Comparisons, Normalize Your Data Chart Design Principles, Deconstruct a Chart, Some Rules Are More Important Than Others, ChartAesthetics, Google Sheets Charts, Bar and Column Charts		
	Interactivity Charting and Storyboard Visualization	Periods	12
Unit - V	Histograms, Pie, Line, and Area Charts, Datawrapper Charts, Annotated Charts, Range Charts, Scatter Bubble Charts. Map Design Principles: Deconstructing a Map, Clarify Point-Versus-Polygon Data, Map One Variable, Not Two, Choose Smaller Geographies for Choropleth Maps Storyboard: Build a Narrative on a Storyboard, Draw Attention to Meaning, Acknowledge Sources and Uncertainty Decide on Your Data Story Format		
Total Periods			60

Text Books	
1	Hands On Data Visualization by Jack Dougherty Ilya Ilyankou
References	
1	1 The Truthful Art Data Charts and Maps for Communicationâ€– Pearson Education 2016
2	2 Few Stephen Show Me the Numbers Designing Tables and Graphs to Enlightenâ€– Second edition Burlingam CA Analytics Press, 2012
E-References	
1	https://www.analyticsvidhya.com/blog/2021/06/must.known-data-visualisation.techniques-for-data-science/

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
Programme	B.Sc	Programme Code	UDS			Regulations		2022-2023	
Department	Data Science		Semester				V		
Course Code	Course Name	Periods per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
22U5DSCP08	DATA VISUALIZATION LAB		0	0	4	2	40	60	100
List of Experiments									
1	Demonstration of Data visualization software: Power BI or Tableau Public or Google DataStudio (Choose any one tool to conduct this lab)								
2	Data Sourcing and migration of data on the chosen platform (Dataset: Superstore SalesDataset/Big mart dataset)								
3	Data Processing: check for missing values and imputation on the chosen platform (Dataset:superstore dataset/Big mart dataset)								
4	Data Processing: Data transformation of data on the chosen platform (Dataset: superstoredataset/Big mart dataset)								
5	Data Processing: creating derived columns of data on the chosen platform and renaming thecolumns (Dataset: superstore dataset/Big mart dataset)								
6	Demonstration: How to build a chart and chart elements such as Title, Legend,Color, Font size,Gridlines, Chart format and Labels.								
7	Building Basic chart (Bar, line, stack and clustered charts) on the chosen platform (Dataset:superstore dataset/Big mart dataset) Building Basic chart (pie, scatter plot, bubble chart) on the chosen platform (Dataset: superstoredataset/Big mart dataset)								
8	Create a Decision Tree, train a Decision Tree using the complete dataset as the trainingdata. Report the model obtained after training.								



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

Elayampalayam, Tiruchengode-637 205.



Programme	B.Sc	Programme Code	UDS				Regulations	2022-2023	
Department	Computer Science		Semester				V		
Course Code	Course Name	Periods per Week		Credit		Maximum Marks			
		L	T	P	C	CA	ESE	Total	
22U5DSC11	Computer Networks	5	0	0	4	25	75	100	
COURSE OBJECTIVES	Resource sharing. ...Resource availability & reliability. Performance managementIncreased storage capacityStreamlined collaboration & communicationReduction of errorsSecured remote access								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas of science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	Recognize the technological trends of Computer Networking
CO 2	Discuss the key technological components of the Network
CO 3	Evaluate the challenges in building networks and solutions to those.
CO 4	A student in Computer Networking will gain valuable skills in computer networks (switching, routing), system and network administration, computer and network security, operating systems, web programming and databases.
CO 5	A student can easily explain OSI working principles.
Pre-requisites	An understanding of the TCP/IP protocol and the its layer model is recommended. Basic knowledge of python (such as through Intro to Computer Science) is required. You should be comfortable with the implementation of basic search algorithms and a work

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	5
		PO 5	6
		PO 6	4
CO 3	4	PO 7	5
CO 4	6		
CO 5	3		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	1	1	1	1
CO3	1	1	2	2	1	3	2
CO4	1	1	1	2	3	1	2
CO5	1	2	3	1	1	2	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction	Periods	12
	Network Hardware - Software - Reference Models - OSI and TCP/IP Models - Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer - Theoretical Basis for Data Communication - Guided Transmission Media		
Unit - II	Wireless Transmission	Periods	12
	Communication Satellites - Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues - Error Detection and Correction.		
Unit - III	Elementary Data Link Protocols	Periods	12
	Sliding Window Protocols - Data Link Layer in the Internet - Medium Access Layer - Channel Allocation Problem - Multiple Access Protocols - Bluetooth.		
Unit - IV	Network Layer	Periods	12
	Design Issues - Routing Algorithms - Congestion Control Algorithms - IP Protocol - IP Addresses - Internet Control Protocols.		
Unit - V	Transport Layer	Periods	12
	Services - Connection Management - Addressing, Establishing and Releasing a Connection - Simple Transport Protocol - Internet Transport Protocols (ITP) - Network Security: Cryptography.		
Total Periods			60

Text Books	
1	A. S Tanenbaum Computer Networks 4th Edition Prentice Hall of India 2008
References	
1	1 B A Forouzan Data Communications and Networking Tata McGraw Hill 4th Edition 2007
2	2 F Halsall Data Communications Computer Networks and Open Systems Pearson Education 2008
3	3 D Bertsekas and R Gallager Data Networks 2nd Edition PHI 2008
4	4 Lamarca Communication Networks Tata McGraw Hill 2002
E-References	
1	www.w3schools.com
2	www.askgenius.com

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)									
Elayampalayam, Tiruchengode-637 205.										
Programme	B.Sc	Programme Code	UDS			Regulations		2022-2023		
Department	Data Science			Semester				VI		
Course Code	Course Name			Periods per Week		Credit		Maximum Marks		
				L	T	P	C	CA	ESE	Total
22U6DSC12	Modern Database Systems			4	0	0	4	25	75	100
COURSE OBJECTIVES	To understand the basic Distributed Database Design, To learn the basics of Parallel Database Systems, To learn efficient NoSQL and Aggregate Data Models, To understand the concepts of Hadoop, Big data and Toknow how to use MongoDB, Hbase, Cassandra									
POs	PROGRAMME OUTCOME									
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.									
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific Requirements									
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science									
PO 4	Communicate the subject effectively.									
PO 5	Understand professional, ethical, and social responsibilities.									
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.									
PO 7	Imbibe Quality Software Development practices									

COs	COURSE OUTCOME
CO 1	Apply the knowledge of Distributed Database system concepts while developing
CO 2	Analyze the complexity of Parallel Database Systems.
CO 3	Choose the appropriate graph database.
CO 4	Investigate database revolution.
CO 5	Analyze about in-memory databases.
Pre-requisites	

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	1	PO 1	2
		PO 2	2
		PO 3	1
CO 2	2	PO 4	1
		PO 5	3
		PO 6	2
CO 3	2	PO 7	2
CO 4	3		
CO 5	3		



COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	3	3	1	2	2
CO2	3	3	2	2	2	3	1
CO3	3	3	2	2	2	3	1
CO4	2	2	1	1	3	2	2
CO5	2	2	1	1	3	2	2

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Distributed Database Systems	Periods	9
	Distributed Database system - Promises - Complications - Design Issues - Distributed DBMS Architecture. Distributed Database Design: Distributed Database Design Issues - Fragmentation - Allocation.		
Unit - II	Parallel Database Systems:	Periods	9
	Architecture - Parallel Data Placement - Query Processing - Load Balancing - Database Clusters.		
Unit - III	NOSQL	Periods	10
	The value of Relational databases - Application and Integration Database - The Emergence of NoSQL. Aggregate Data Models - Map-Reduce - Graph Databases.		
Unit - IV	Next Generation Databases	Periods	10
	Database Revolutions - Google, Big data and Hadoop.		
Unit - V	Distributed Database Patterns	Periods	10
	Document Databases - Column Databases - In-memory Databases. Distributed Database Patterns: MongoDB - Hbase - Cassandra.		
Total Periods			60

Text Books	
1	M.Tamer Ozsu, Patrick Valduriez, Principles of Distributed Database Systems, 2011 - unit 1, 2
2	Pramod J.Sadalage and Martin Fowler, NoSQL Distilled – Brief Guide to the Emerging World of Polyglot Persistence, Pearson Education, 2013- unit 3
3	Guy Harrison, Next Generation Databases: NoSQL and Big Data, A press, 2015- unit 4,5
References	
1	Ramez Elmasri and Shamkrant Navathe, Fundamentals of Database Systems, Addison Wesley, 2013.
2	Kristina Chodorow, MongoDB: The Definitive Guide, O'Reilly Media, 2012.
E-References	

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							
Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023		
Department	Data Science		Semester			VI		
Course Code	Course Name	Periods per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
22U6DSCP09	Modern Database Systems Lab	0	0	4	2	40	60	100
List of Experiments								
1	Create a distributed Database for Bookstore.							
2	Create a Parallel Database for University Counseling.							
3	Create No-SQL database using MongoDB Library Management System.							
4	Distribution using Map-Reduce on Big Data(Hadoop)							
5	Create a database and implement the following functions using Neo4J <ul style="list-style-type: none"> a. count(*) b. group by c. order by d. limit e. join 							
6	Implement column oriented database.							
7	Implement Partitioning on the tables.							
8	Create a collection using MongoDB.							

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
	Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023			
Department	Data Science		Semester			VI			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
22U6DSC13	Deep Learning	4	0	0	4	25	75	100	
COURSE OBJECTIVES	To understand the basic Distributed Database Design, To learn the basics of Parallel Database Systems, To learn efficient NoSQL and Aggregate Data Models, To understand the concepts of Hadoop, Big data and Toknow how to use MongoDB, Hbase, Cassandra								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices								

COs	COURSE OUTCOME
CO 1	Apply the knowledge of Distributed Database system concepts while developing
CO 2	Analyze the complexity of Parallel Database Systems.
CO 3	Choose the appropriate graph database.
CO 4	Investigate database revolution.
CO 5	Analyze about in-memory databases.
Pre-requisites	

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	1	PO 1	2
		PO 2	2
		PO 3	1
CO 2	2	PO 4	1
		PO 5	3
		PO 6	2
CO 3	2	PO 7	2
CO 4	3		
CO 5	3		



COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	3	3	1	2	2
CO2	3	3	2	2	2	3	1
CO3	3	3	2	2	2	3	1
CO4	2	2	1	1	3	2	2
CO5	2	2	1	1	3	2	2

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	



Content of the Syllabus			
Unit - I	Basics of Neural Networks	Periods	9
	Basic Concept of Neurons - Perceptron Algorithm - Feed Forward and Backpropagation Networks. Perceptron Training Rule, Gradient Descent Rule, Restricted Boltzmann Machines, Deep Belief Networks.		
Unit - II	Activation Functions:	Periods	9
	Sigmoid, ReLU, Hyperbolic Fns, Softmax, Optimization and Regularization: Adam optimization, Overfitting and Capacity, Cross Validation, Feature Selection, Regularization, Hyperparameter tuning.		
Unit - III	Convolutional Neural Networks	Periods	10
	CNN Architectures - Convolution - Pooling Layers - Transfer Learning - Image Classification using Transfer Learning - Recurrent and Recursive Nets - Recurrent Neural Networks - Deep Recurrent Networks - Recursive Neural Networks - Applications.		
Unit - IV	Deep auto encoders	Periods	10
	Introduction - Use of autoencoders - stacked denoising autoencoders - deep networks for unsupervised generative learning.		
Unit - V	Applications of deep learning	Periods	10
	Image processing, Natural Language Processing - speech recognition, video analytics.		
Total Periods			60

Text Books	
1	Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.
2	Li Deng and Dong Yu ., Deep Learning Methods and Applications, Foundations and Trends in Signal Processing, 2014.
References	
1	Yegnanarayana, B., Artificial Neural Networks, PHI Learning Pvt. Ltd, 2009.
2	Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
E-References	
1	https://neuralnetworksanddeeplearning.com

		VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FORWOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						
Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023		
Department	Data Science		Semester			VI		
Course Code	Course Name	Periods per Week		Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total
22U6DSCP10	DEEP LEARNING LAB	0	0	4	2	40	60	100
List of Experiments								
1	Introduction to DL and Framework							
2	Feed Forward Network on sample dataset							
3	Multi-layer perceptron (MLP) on real-time dataset							
4	Convolution neural network on binary classification task:Cat and Dog dataset							
5	Convolution neural network on multi-classification task:Dog breedclassifications							
6	Transfer learning using pre trained architectures							
7	Hyper parameter optimization on CNN models							
8	Recurrent neural network on stock price prediction.							

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Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023			
Department	DATA SCIENCE		Semester		VI			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total
22U6DSCPR01	Project	0	0	5	3	40	60	100
Project Work Pattern								
FIRST REVIEW:				(20 Marks)				
<ol style="list-style-type: none"> 1. Project Title 2. Project Platform (Language / Package Selected) 3. Confirmation Letter (from Company / Industry) 4. Details of Internal Guide with Designation & Qualification (in the company / Industry) 5. Presentation 								
SECOND REVIEW:				(20 Marks)				
<ol style="list-style-type: none"> 1. Work Observation 2. Modules in Project (Design Screens Sample) 3. DFD / ERD / System Flow Diagram (Whichever Applicable) 4. Estimated Time of Completion 5. Completed Work in the form of Percentage Analysis 6. PowerPoint Presentation. 								
FINAL REVIEW:				(60 Marks)				
<ol style="list-style-type: none"> 1. Documentation 2. Screens Shots 3. DFD / ERD / System Flow Diagram (Whichever Applicable) 4. Final Project Report (with executable format including complete source code) 								
The Passing minimum shall be 40% out of 60 marks (24 Marks)								

SBEC-SKILL BASED ELECTIVE

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)					 <small>ISO 9001:2008 www.tuv.com ID 9105078427</small>							
Programme		B.Sc	Programme Code		UDS		Regulations		2022-2023				
Department		Data Science			Semester				III				
Course Code		Course Name			Periods per Week		Credit		Maximum Marks				
22U3DSS01		SYSTEM ADMINISTRATION AND MAINTENANCE			L T P C		CA		ESE		Total		
		2			0		0		2		25	75	100
COURSE OBJECTIVES		To study the basic concepts of computer system and operating system. To configure the system installation, maintenance and trouble shooting. To understand the basic concepts laptop, portable device and preventive maintenance techniques.											
POs		PROGRAMME OUTCOME											
PO 1		Understand and apply fundamental principles, concepts and methods in critical areas science And multidisciplinary fields.											
PO 2		Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.											
PO 3		Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science											
PO 4		Communicate the subject effectively.											
PO 5		Understand professional, ethical, and social responsibilities.											
PO 6		Ability to understand and analyse a given real-time problems and propose feasible computing solutions.											
PO 7		Imbibe Quality Software Development practices.											

COs	COURSE OUTCOME
CO 1	To impart the knowledge of various hardware components of a computer
CO 2	To provide the skill of assembling the computer.
Pre-requisites	Basic knowledge of Computer Hardware.



Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	3
		PO 5	3
		PO 6	4
CO 3	3	PO 7	4
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	2	2	1	1
CO3	1	2	3	3	3	2	2
CO4	1	1	2	2	2	3	1
CO5	1	1	1	1	1	2	2

Course Assessment Methods	
Direct	1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect	1. Course End Delivery

Content of the Syllabus			
Unit - I	Introduction	Periods	6
	Introduction to Personal Computer: Computer System – Purposes & Characteristics of Cases - Power Supplies - Internal Components - Ports - Cables - Input devices - Output devices. Safe Lab Procedures and Tool Use: Safe Working Conditions and Procedures - Tools and Software used with PC components.		
Unit - II	Computer Assembly:	Periods	6
	Open Case - Install Power Supply - Attach Components to Motherboard - Installation: Motherboard - Internal Drives - Drives in External Bayes -Adapter Cards. Internal cables connections -Reattach side panels - Connection of external cables - Boot the Computer. Preventive Maintenance and Troubleshooting: Purpose of Preventing Maintenance - Steps of Troubleshooting Process.		
Unit - III	Fundamental Operating System:	Periods	6
	Purposes - Characteristics of Modern Operating Systems – Concepts Comparisons, Limitations, and Compatibilities - Determination of Operating System based on Customer Needs - Installation of Operating System -Navigate a GUI (Windows) - Common Preventive Maintenance Techniques- Troubleshoot.		
Unit - IV	Fundamental Laptops and Portable Devices:	Periods	6
	Common Uses - Components of Laptop - Comparison of the components of Desktop and Laptops - Configure Laptops - Mobile Phone Standards - Preventive Maintenance Techniques - Troubleshoot Laptop and Portable Devices. Fundamental Printers and Scanners: Types of Printers and Scanners - Installation and Configuration Process of Printers and Scanners - Preventive Maintenance Techniques - Troubleshoot.		
Unit - V	Fundamental Networks:	Periods	6
	Principles - Types - Concepts and Technologies - Physical Components - LAN Topologies and Architectures- Standard Organizations - Ethernet Standards - OSI and TCP/IP Models - Configuration of NIC and Modem - Establishing Connectivity - Preventive Maintenance Techniques - Troubleshoot. Fundamental Security: Security Threats - Security Procedures - Preventive Maintenance Techniques - Troubleshoot Security.		
Total Periods			30

Text Books	
1	David Anfinson & Ken Quamme, "IT Essentials: PC Hardware and Software Companion Guide", 3rd Edition, Pearson Publications, 2008.
References	
1	Quentin Docter, Emmett Dulaneyand Toby Skandier, "CompTIA A+ Complete Review Guide: Exam 220-901, Exam 220 - 902", 3rd Edition, Wiley Publications, 2015.
E-References	
1	https://www.alzashop.com/how-to-build-your-own-PC

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
	Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023		
Department	Data Science		Semester			IV			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
22U4DSS02	CYBER SECURITY		2	0	0	2	25	75	100
COURSE OBJECTIVES	the technical knowledge and skills needed to protect and defend computer systems and networks. To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	Understand the fundamentals of Cyber security, Cyber Crime, threats and vulnerabilities.
CO 2	Apply the different operational tips for Social networks and browsers.
CO 3	Apply the different Investigation roles to identify the cyber crime.
CO 4	Understand various digital forensic and analyzing data for preventing cyber crime.
CO 5	Analyze and Create the Cyber Crime Models
Pre-requisites	Familiarity with Unix, Linux, and Windows operating system. Knowledge about SaaS models and cloud computing.

Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	4
		PO 5	4
		PO 6	5
CO 3	3	PO 7	6
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	1	1	1	1
CO3	1	2	3	2	2	1	1
CO4	1	1	2	3	3	2	1
CO5	1	1	1	2	2	3	2

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus			
Unit - I	Introduction to cyber crime	Periods	6
	Introduction to cyber crime: Classification of cyber crimes - reasons for commission of cyber crime - malware and its type - kinds of cyber crime - authentication - encryption - digital signatures - antivirus - firewall - steganography - computer forensics - why should we report cyber crime - introduction counter cyber security initiatives in india - generating secure password - using password manager-enabling two-step verification - security computer using free antivirus.		
Unit - II	Tips for buying online	Periods	6
	Tips for buying online: Clearing cache for browsers - wireless LAN-major issues with WLAN-safe browsing guidelines for social networking sites - email security tips - introduction-smartphone security guideling - purses, wallets, smartphones - platforms, setup and installation-communicating securely with a smartphone.		
Unit - III	Cyber investigation roles	Periods	6
	Cyber investigation roles: Introduction - role as a cyber crime investigator - the role of law enforcementofficers - the role of the prosecuting attorney - incident response: introduction-postmortem versus liveforensics - computer analysis for the hacker defender program-network analysis - legal issues of intercepting wifi transmission - wifi technology - wifi RF-scanning RF - eavesdropping on wifi - fourth amendment expectation of privacy in WLAN.		
Unit - IV	Seizure of digital information	Periods	6
	Seizure of digital information: introduction - defining digital evidence - digital evidence seizure methodology - factors limiting the wholesale seizure of hardware - other options for seizing digital evidence - common threads within digital evidence seizure - determining the most appropriate seizure method-conducting cyber investigations- demystifying computer/cyber crime - IP addresses - the explosion ofnetworking - interpersonal communication.		
Unit - V	Digital forensics and analyzing data	Periods	6
	Digital forensics and analyzing data: introduction - the evolution of computer forensics- phases of digital forensics-collection - examination-analysis - reporting - Cyber crime prevention:introduction - crime targeted at a government agency.		
Total Periods			30

Text Books	
1	Dr.JeetendraPande, introduction to cyber security published by Uttarakhand Open University,2017.Chapter: 1.2-6.4, 9.3-12.2
2	Anthony reyes, Kevin oâ€™shea, jimsteele, jonR.hansen, captain Benjamin R.jean Thomas Ralph, Cyber crime investigations bridging the gaps between security professionals, law enforcement, andprosecutors2007.Chapter: 4, 5, 6, 7, 8, 9, 10
References	
1	https://www.sanfoundry.com/best-reference-books-information-network-security/
2	https://www.geekforgreeks.com/best-reference-books-information-network-security/
E-References	
1	https://www.consilium.europa.eu/media/40984/intro-cyber-security-002.pdf
2	https://people.scs.carleton.ca/paulv/5900wBooks.html



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)

Elayampalayam, Tiruchengode-637 205.



Programme	B.Sc	Programme Code	UDS				Regulations	2022-2023	
Department	Data Science		Semester				V		
Course Code	Course Name	Periods per Week		Credit		Maximum Marks			
		L	T	P	C	CA	ESE	Total	
22U5DSS03	WIRELESS NETWORKS		2	0	0	2	25	75	100
COURSE OBJECTIVES	To understand about Wireless Networks - Protocol Stack and Standards. To Study about Fundamentals of Mobile Network Layer and Mobile Ad-Hoc Network, and its Protocols and Applications. To Study about Fundamentals of Mobile Transport Layer and Class								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	Understanding the concept of Wireless Networks - Protocol Stack and Standards.
CO 2	Evolution of 3G Networks - its Architecture and Applications and to outline the Design and implement Wireless Protocols.
CO 3	Analyze the fundamentals of Mobile Network Layer and Mobile Ad-Hoc Network, and its Protocols and Applications.
CO 4	Analyze the fundamentals of Mobile Transport Layer and Classical TCP Improvements
CO 5	Evolution of 4G Networks - its Architecture and Applications and to outline the Design and implement Wireless Protocols
Pre-requisites	C or Java programming, Course in algorithms, Course in probability. Basic knowledge of hardware, software, protocols and the connection medium.



Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	4
		PO 5	5
		PO 6	6
CO 3	3	PO 7	5
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	1	1	1	1
CO3	1	2	3	2	1	1	1
CO4	1	1	2	3	2	1	2
CO5	1	1	1	2	3	2	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Wireless LAN - Introduction	Periods	6
	Wireless LAN - Introduction-WLAN Technologies: Infrared - UHF Narrowband - Spread Spectrum -IEEE802.11: System Architecture - Protocol Architecture - Physical Layer - MAC Layer - 802.11b - 802.11a - HIPERLAN: WATM - BRAN - HiperLAN2 - Bluetooth: Architecture - Radio Layer - BasebandLayer - Link Manager Protocol - Security - IEEE802.16-WIMAX: Physical Layer - MAC - Spectrum Allocation For WIMAX.		
Unit - II	Mobile Network Layer	Periods	6
	Mobile Network Layer - Introduction - Mobile IP: IP Packet Delivery - Agent Discovery - Tunneling AndEncapsulation - IPV6-Network Layer In The Internet- Mobile IP Session Initiation Protocol - Mobile Ad-Hoc Network: Routing - Destination Sequence Distance Vector - Dynamic Source Routing.		
Unit - III	Mobile Transport Layer	Periods	6
	Mobile Transport Layer - TCP Enhancements For Wireless Protocols - Traditional TCP: Congestion Control - Fast Retransmit/Fast Recovery - Implications Of Mobility - Classical TCP Improvements: IndirectTCP - Snooping TCP - Mobile TCP - Time Out Freezing - Selective Retransmission - Transaction Oriented TCP - TCP Over 3G Wireless Networks.		
Unit - IV	Wireless Wide Area Network	Periods	6
	Wireless Wide Area Network - Overview Of UTMS Terrestrial Radio Access Network- UMTS CoreNetwork Architecture: 3G-MSC - 3G-SGSN - 3G-GGSN - SMS- GMSC/SMS- IWMSC - Firewall - DNS/DHCP-High Speed Downlink Packet Access - LTE Network Architecture And Protocol.		
Unit - V	4G Networks - Introduction	Periods	6
	4G Networks - Introduction - 4G Vision - 4G Features And Challenges - Applications Of 4G - 4G Technologies: Multicarrier Modulation - Smart Antenna-Techniques - OFDM-MIMO Systems - AdaptiveModulation And Coding With Time Slot Scheduler - Cognitive Radio.		
Total Periods			30

Text Books	
1	Jochen Schiller - Mobile Communications - Second Edition - Pearson Education 2012.
2	Vijay Garg - Wireless Communications And Networking - First Edition - Elsevier 2014.
References	
1	https://solutionsreview.com/wireless-network/the-essential-wireless-networking-books-for-network-engineers/
E-References	
1	https://www.geeksforgeeks.org/wireless-communication-set-1/
2	https://www.tutorialspoint.com/data_communication_computer_network/index.htm

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	Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023			
Department	Data Science		Semester			VI			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
22U6DSS04	DIGITAL MARKETING		2	0	0	2	25	75	100
COURSE OBJECTIVES	Understand concept of Ecommerce and its types Study the various online payment and marketing on Web Understand various E-business Strategies.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	Understand concept of Ecommerce and its types Study the various online payment and marketing on Web
CO 2	To the various online payment and marketing on Web
CO 3	Understand various E-business Strategies.
CO 4	Develop a digital marketing plan that will address common marketing challenges
CO 5	Articulate the value of integrated marketing campaigns across SEO, Paid Search, Social, Mobile, Email, Display Media, Marketing Analytics.
Pre-requisites	Understand Design Thinking & Planning.Be Tech Savvy. Be Persuasive.Search Engine Optimization (SEO) & Search Engine Marketing (SEM) Content Marketing.Data / Analytics

Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	4
		PO 5	5
		PO 6	6
CO 3	3	PO 7	6
CO 4	4		
CO 5	6		



COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	1	1	1	1
CO3	1	2	3	2	1	1	1
CO4	1	1	2	3	2	1	1
CO5	1	1	1	1	2	3	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction to Digital Marketing	Periods	6
	Introduction to think - Digital Marketing Strategy -Introduction-Key terms and Concepts - What is Marketing - What is Digital Marketing - Understanding Marketing Strategy - The Building Blocks of Marketing Strategy - Crafting a Digital Marketing Strategy - Case Study		
Unit - II	Market Research - Introduction	Periods	6
	Market Research - Introduction - Key terms and Concepts - the Importance of Market Research - Key Concepts in Market Research - Online Research Methodologies - Justifying the Cost of Research - tools forthe trade - Advantages and Challenges		
Unit - III	Content Marketing Strategy	Periods	6
	Content Marketing Strategy - Introduction - Key Terms and Concepts - Defining Content Marketing - Strategic Building Blocks - Content Creation - Content Channel Distribution -Tools for the Trade - Advantages and Challenges		
Unit - IV	User Experience Design “ Introduction	Periods	6
	User Experience Design - Introduction - Key Terms and Concepts - Understanding UX design - Core principles of UX design -Mobile UX - Step -by-step guide to UX design - Tools of the trade - Case Study		
Unit - V	Introduction-Web development and Design	Periods	6
	Web development and Design - Introduction - Key terms and concepts - Web design - Web Development - Mobile Development - Step-by-step guide to building a website - Case		
Total Periods			30

Text Books	
1	Rob Stokes, “e-Marketing the Essential guide to marketing in a digital world”, 5th Edition,2017.
References	
1	https://ondigitalmarketing.com/learn/odm/
E-References	
1	https://mailchip.com/marketing-glossary/digital-marketing/

ELECTIVES

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
	Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023			
Department	Data Science		Semester			V			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
22U5DSE01	CLOUD COMPUTING		5	0	0	3	25	75	100
COURSE OBJECTIVE S	An insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas of science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyze a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	Remember the basic concepts of softwareEngineering.
CO 2	Understanding requirement analysis.
CO 3	Apply software design.
CO 4	Evaluate with UML.
CO 5	Implement coding and testing.
Pre-requisites	Basic knowledge about Computing techniques

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	4
		PO 5	4
		PO 6	2
CO 3	3	PO 7	2
CO 4	3		
CO 5	4		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	2	2
CO2	2	3	2	1	1	3	1
CO3	1	2	3	2	2	2	2
CO4	1	2	3	2	2	2	2
CO5	1	1	2	3	3	1	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Cloud Computing Overview	Periods	15
	Origins of Cloud computing - Cloud components -Essential characteristics - On-demandself-service- Broadnetwork access- Locationindependent resource pooling-Rapid elasticity-Measured service- Comparing cloud providers withtraditional IT service providers- Roots of cloudcomputing.		
Unit - II	Cloud Insights	Periods	15
	Architectural influences - High-performancecomputing- Utility and Enterprise grid computing-Cloud scenarios - Benefits: scalability-simplicity-vendors - security - Limitations -Sensitive information - Application development-security level of third party - security benefits- Regularity issues: Government policies.		
Unit - III	Cloud Architecture - Layers and Models	Periods	15
	Layers in cloud architecture - Software as aService - features of SaaS and benefits - Platformas a Service-features of PaaS and benefits-Infrastructure as a Service- features of IaaS andbenefits- Service providers-challenges and risksin cloud adoption. Cloud deployment model: Publicclouds - Private clouds - Community clouds -Hybrid clouds - Advantages of Cloud computing.		
Unit - IV	Cloud Simulators - CloudSim and GreenCloud	Periods	15
	Introduction to Simulator- understanding CloudSimsimulator- CloudSim Architecture - UnderstandingWorking platform for CloudSim- Introduction toGreen Cloud		
Unit - V	Introduction to VMWare Simulator	Periods	15
	Basics of VMWare- advantages of VMwarevirtualization- using Vmware workstation- creatingvirtual machines- understanding virtual machines-create a new virtual machine on local host- cloning virtualmachines- virtualize a physicalmachine- starting and stopping a virtual machine.		
Total Periods			60

Text Books	
1	Cloud computing a practical approach - Anthony T.Velte Toby J. Velte Robert Elsenpeter TATA McGraw-Hill New Delhi 2010
2	Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
References	
1	Cloud computing for dummies - Judith Hurwitz Robin Bloor Marcia Kaufman Fern Halper - Wiley Publishing Inc – 2010
2	Cloud Computing Principles and Paradigms - Edited by Rajkumar Buyya James Broberg Andrzej Goscinski - John Wiley and Sons Inc. 2011

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
	Programme	B.Sc	Programme Code	UDS	Regulations	2022-2023			
Department	Data Science		Semester			V			
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T	P	C	CA	ESE	Total	
22U5DSE02	Big Data Analytics		5	0	0	3	25	75	100
COURSE OBJECTIVES	Use of Devices, Gateways and Data Management in IoT. Design IoT applications in different domain and be able to analyze their performance and implement basic IoT applications on embedded platform.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	To gain knowledge about Bigdata
CO 2	Understanding Big Data Analytics
CO 3	Apply the Big Data Technology Landscape: NoSQL: Hadoop
CO 4	Evaluate Hadoop Applications.
CO 5	Learn about MongoDB
Pre-requisites	Basic Knowledge about Bigdata

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	2
CO 2	2	PO 4	3
		PO 5	3
		PO 6	3
CO 3	2	PO 7	2
CO 4	3		
CO 5	2		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	1	1	1	2
CO2	2	3	3	2	2	2	1
CO3	2	3	3	2	2	2	1
CO4	1	2	2	3	3	3	2
CO5	2	3	3	2	2	2	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Types of Digital Data	Periods	12
	Classification of Digital Data. Introduction to Big Data: Characteristics of Data- Evolution of Big Data- Definition of Big Data- Challenges with Big Data-What is big Data? Why big Data? Traditional Business Intelligence versus Big Data-A Typical Data Warehouse Environment- A TypicalHadoop Environment.		
	Big Data Analytics	Periods	12
Unit - II	Where do we Begin? What is Big Data Analytics? What is Big Data Analytics Isn't? Classification ofAnalytics-Why Big Data Analytics Important? Challenges Facing Big Data-Data Science-Terminologies used in Big Data Environment-Basically Available Soft State Eventual consistency.		
	The Big Data Technology Landscape: NoSQL: Hadoop	Periods	12
Unit - III	Where it is used? What is it? Types of NoSQL Databases- Why NoSQL - Advantages of NoSQL- What we miss with NoSQL? -Use of NoSQL in Industry- NoSQL Vendors- SQL vs NoSQL-NewSQL-comparison of SQL, NoSQL and NewSQL.Hadoop:Feature of Hadoop-Key Advantage of Hadoop-versions of Hadoop- Overview of Hadoop Ecosystem- Hadoop Distribution- Hadoop versusSQL- cloud Based Hadoop solution		
	Introduction to Hadoop	Periods	12
Unit - IV	Introducing Hadoop-Why Hadoop?-why not RDBMS?- RDBMS vs Hadoop=Distributed Computing Challenges- History of Hadoop-Overview of Hadoop- Use Case of Hadoop- Hadoop Distribution- HDFS-Processing Data with Hadoop- Managing resources and Applications with Hadoop YARN-Interacting with Hadoop Ecosystem.		
Unit - V	Introduction to MongoDB	Periods	12
	What is MongoDB? -Why MongoDB-Terms Used in RBDMS and MongoDB- Data Types in MongoDB-MongoDB Query Language.		
Total Periods			60

Text Books	
1	Seema Acharya, Subhashini Chellappan, Big Data and Analytics, Wiley Publication, 2015.
References	
1	Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, Big Data for Dummies, John Wiley & Sons, Inc., 2013.
2	Tom White, Hadoop: The Definitive Guide, O'Reilly Publications, 2011.
3	Kyle Banker, Mongo DB in Action, Manning Publications Company, 2012.
4	Russell Bradberry, Eric Blow, Practical Cassandra A developers Approach, Pearson Education, 2014.
E-References	
1	https://www.webopedia.com/TERM/B/Big_data_analytics.html
2	https://www.simplilearn.com/data-science-vs-big-data-vs-data-analytics-article

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.									
	Programme	B.Sc	Programme Code	UDS			Regulations	2022-2023		
Department	Data Science			Semester			V			
Course Code	Course Name	Periods per Week		Credit		Maximum Marks				
		L	T	P	C	CA	ESE	Total		
22U5DSE03	Software Engineering			5	0	0	3	25	75	100
COURSE OBJECTIVE S	To understand the software engineering concepts. Understand the coding, testing and user interface design Design, develop the software projects and software reliability and quality management									
POs	PROGRAMME OUTCOME									
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields									
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.									
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science									
PO 4	Communicate the subject effectively.									
PO 5	Understand professional, ethical, and social responsibilities.									
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.									
PO 7	Imbibe Quality Software Development practices									

COs	COURSE OUTCOME
CO 1	Basic knowledge and understanding of the analysis and design of complex systems
CO 2	Ability to apply software engineering principles and techniques
CO 3	Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
CO 4	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
CO 5	Demonstrate an ability to use the techniques and tools necessary for engineering practice
Pre-requisites	Learn a Programming Language.Learn Data Structures and Algorithms.Build a Portfolio on Github.Ace the Coding Interview.Expand Your Knowledge

Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	4
		PO 5	5
		PO 6	6
CO 3	3	PO 7	6
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	1	1	1	1
CO3	1	2	3	2	1	1	1
CO4	1	1	2	3	2	1	1
CO5	1	1	1	2	3	2	2

Course Assessment Methods



Direct
<ol style="list-style-type: none"> 1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
<ol style="list-style-type: none"> 1. Course End Delivery

Content of the Syllabus

Unit - I	Introduction	Periods	12
	Introduction - Software Engineering Discipline - Evolution and Impact - Programs Vs Software Products. Software Life Cycle Models: Use of a Life Cycle Models - Classical Waterfall Model - Iterative Waterfall Model - Prototyping Model - Evolutionary Model - Spiral Model. Software Project Management: Responsibilities of a Software Project Manager - Project Planning - Metrics for Project Size Estimation - Project Estimation Techniques - Risk Management.		
Unit - II	Requirements Analysis and Specification	Periods	12
	Requirements Analysis and Specification: Requirements Gathering and Analysis - Software Requirements Specification (SRS) - Formal System Development Techniques. Software Design: Characteristics of a Good Software Design - Cohesion and Coupling - Neat Arrangement - Software Design Approaches.		
Unit - III	Function-Oriented Software Design	Periods	12
	Function-Oriented Software Design: Overview of SA/SD Methodology - Structured Analysis - Data Flow Diagrams (DFDs). Object Modeling Using UML: Overview of Object-Oriented Concepts - UML Diagrams - Use Case Model - Class Diagrams - Interaction Diagrams - Activity Diagrams - State Chart Diagram.		
Unit - IV	User Interface Design	Periods	12
	User Interface Design: Characteristics of a Good User Interface - Basic Concepts - Types of User Interfaces - Component-Based GUI Development; Coding and Testing: Coding - Testing - UNIT Testing - Black-Box Testing - White-Box Testing - Debugging - Integration Testing - System Testing.		
Unit - V	Software Reliability and Quality Management	Periods	12
	Software Reliability and Quality Management: Software Reliability - Statistical Testing - Software Quality - Software Quality Management System - ISO 9000. Computer Aided Software Engineering: CASE Environment - CASE support in Software Life Cycle - Characteristics of CASE Tools - Architecture of a CASE Environment. Software Maintenance: Characteristics of Software Maintenance - Software Reverse Engineering - Software Maintenance Process Models - Estimation of Maintenance Cost. Software Reuse: Issues in any Reuse Program - Reuse Approach.		
Total Periods			60

Text Books

1	Rajib Mall, "Fundamentals of Software Engineering", 3rd Edition, Prentice Hall of India Private Limited, 2008.
References	
1	Rajib Mall, "Fundamentals of Software Engineering", 4th Edition, Prentice Hall of India Private Limited, 2014.
2	Richard Fairley, "Software Engineering Concepts", TMGH Publications, 2004.
E-References	
1	https://www.geeksforgeeks.org/software-engineering/
2	https://www.javatpoint.com/software-engineering-tutorial

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023			
Department	Data Science		Semester			VI			
Course Code	Course Name		Periods per Week		Credit	Maximum Marks			
			L	T	P	C	CA	ESE	Total
22U6DSE04	Predictive Analysis		5	0	0	4	25	75	100
COURSE OBJECTIVES	Develop theoretical understanding of modeling techniques in data science. Formulate complex decision-making problems with data for predictive analysis in business context. Analyze and evaluate predictive model outcomes for informing decision-making.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas of science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problem and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices								

COs	COURSE OUTCOME
CO 1	Analyze the difference between predictive modeling with other models.
CO 2	Represent data in various statistical formats.
CO 3	Identify the methods for data cleaning.
CO 4	Analyze different Association rules and Item sets.
CO 5	Assess the predictive modeling and Linear Regression.
Pre-requisites	the practice of aggregating and analyzing historical data to anticipate future outcomes. Aggregating multiple datasets connects the dots between different departments, business processes, and types of data (structured vs. unstructured).



Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	1
		PO 3	3
CO 2	2	PO 4	4
		PO 5	5
		PO 6	6
CO 3	3	PO 7	6
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	1	1	1	1
CO2	2	2	2	1	1	1	1
CO3	1	1	3	2	1	1	1
CO4	1	1	2	3	2	1	1
CO5	1	1	1	2	3	2	2

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction to Predictive Analysis	Periods	12
	Introduction to Predictive Analysis: Analytics - Predictive Analytics- Business Intelligence - Predictive Analytics vs. Business Intelligence - Predictive Analytics vs. Statistics - Predictive Analytics vs. Data Mining- Challenges in using predictive analytics.Predictive Analytics Processing steps - Business understanding - Defining data for predictive modelling - Defining the target variable - Defining measures of success for predictive models.		
Unit - II	Understanding Data	Periods	12
	Understanding Data: Single Variable Summaries- Data Visualisation in one dimension - Histograms - Multiple Variable summaries - Data Visualisation, two or higher dimensions - Value of statistical significance		
Unit - III	Data Preparation- Variable cleaning	Periods	12
	Data Preparation- Variable cleaning: Incorrect values - consistency in Data Formats - Outliers - Multidimensional Outliers - Missing values - Fixing Missed DataFeature creation: Simple Variable Transformations - Fixing Skew - Binning Continuous Variables-Numeric Variable Scaling - Nominal variable transformation - Ordinal variable transformation - Data and time variable features - ZIP Code features - Multidimensional Features- Variable selection Prior to modeling - Sampling		
Unit - IV	Item sets	Periods	12
	Item sets: Terminology - Parameter Settings - Frequent Item set.Predictive Modeling: Logistic Regression-K-Nearest Neighbor		
Unit - V	Predictive Modeling	Periods	12
	Predictive Modeling: Naive Bayes - Regression models -Linear Regression.Assessing Predictive Models: Batch approach to model assessment - Assessing Regression models		
Total Periods			60

Text Books	
1	Dean Abbott, Applied Predictive Analytics - Principles and Techniques for the Professional Data Analyst, Wiley India Pvt Ltd., 2015.
References	
1	1. Daniel T.Larose, Chantal D.Larose, Data Mining and Predictive Analysis, Wiley India Pvt Ltd, 2nd Edition, 2017.
2	2. Max Kuhn, Kjell Johnson, Applied Predictive Modeling, Springer, 2016.
E-References	
1	https://medium.com/analytics-vidhya/predictive-web-analytics-a-case-study-f30feda45002
2	https://cloud.google.com/learn/what-is-predictive-analytics

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)										
Elayampalayam, Tiruchengode-637 205.											
Programme	B.Sc	Programme Code	UDS			Regulations		2022-2023			
Department	Data Science				Semester			VI			
Course Code	Course Name				Periods per Week		Maximum Marks				
					L	T	P	C	CA	ESE	Total
22U6DSE05	Operating System				5	0	0	4	25	75	100
COURSE OBJECTIVE S	To introduce basic concepts and functions of operating systems and understand the concept of process, thread and resource management. To understand various Memory, I/O and File management techniques.										
POs	PROGRAMME OUTCOME										
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.										
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.										
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science										
PO 4	Communicate the subject effectively.										
PO 5	Understand professional, ethical, and social responsibilities.										
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.										
PO 7	Imbibe Quality Software Development practices.										



COs	COURSE OUTCOME
CO 1	Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions
CO 2	To provide users a convenient interface to use the computer system.
CO 3	To act as an intermediary between the hardware and its users, making it easier for the users to access and use other resources.
CO 4	The core of the course contains concurrent programming (threads and synchronization), inter process communication, and an introduction to distributed operating systems.
CO 5	I understand the high-level structure of the Linux kernel both in concept and source code
Pre-requisites	Good programming skills and ability to reason well. Good knowledge of C, Computer Organization and Architecture, x86 Assembly level programming

Knowledge Levels							
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing							
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)							
COs	KLs		POs		KLs		
CO 1	1		PO 1	1			
			PO 2	2			
			PO 3	2			
CO 2	2		PO 4	4			
			PO 5	4			
			PO 6	2			
CO 3	3		PO 7	2			
CO 4	5						
CO 5	6						
Cos	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	1	1	2	2
CO2	2	3	3	1	1	3	1
CO3	1	2	2	2	2	2	2
CO4	1	1	1	2	2	1	1
CO5	1	1	1	1	1	1	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction	Periods	12
	Introduction - History of operating system- Different kinds of operating system - Operating system concepts - System calls-Operating system structure.		
	Processes and Threads	Periods	12
Unit - II	Processes and Threads: Processes - threads - thread model and usage - inter process communication.		
	Scheduling	Periods	12
Unit - III	Scheduling - Memory Management: Memory Abstraction - Virtual Memory - Page replacement algorithms.		
Unit - IV	Deadlocks	Periods	12
	Deadlocks: Resources- introduction to deadlocks - deadlock detection and recovery - deadlocks avoidance - deadlock prevention. Multiple processor system: multiprocessors - multi computers.		
	Input / Output	Periods	12
Unit - V	Input / Output: principles of I/O hardware - principles of I/O software. Files systems: Files - directories - files systems implementation - File System Management and Optimization.		
	Total Periods		60

Text Books	
1	Andrew S. Tanenbaum, "Modern Operating Systems", 2nd Edition, PHI private Limited, New Delhi, 2008.
References	
1	William Stallings, "Operating Systems - Internals & Design Principles", 5th Edition, Prentice - Hall of India private Ltd, New Delhi, 2004.
2	Sridhar Vaidyanathan, "Operating System", 1st Edition, Vijay Nicole Publications, 2014.
E-References	
1	https://www.google.com/search?q=geeksforgeeks+operating+system&ei=xt4RY-irHs3F4-EPIbSr2Ao&oq=geeksforgeeks+in+operating+&gs
2	https://www.geeksforgeeks.org/last-minute-notes-operating-systems/

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)									
Programme		B.Sc	Programme Code	UDS	Regulations	2022-2023				
Department	Data Science			Semester			VI			
Course Code	Course Name			Periods per Week		Maximum Marks				
INTERNET OF THINGS				L	T	P	C	CA	ESE	Total
22U6DSE06				5	0	0	4	25	75	100
COURSE OBJECTIVES	Use of Devices, Gateways and Data Management in IoT. Design IoT applications in different domain and be able to analyze their performance and implement basic IoT applications on embedded platform.									
POs	PROGRAMME OUTCOME									
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.									
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.									
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science									
PO 4	Communicate the subject effectively.									
PO 5	Understand professional, ethical, and social responsibilities.									
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.									
PO 7	Imbibe Quality Software Development practices.									

COs	COURSE OUTCOME
CO 1	Remember IoT and Web technology.
CO 2	Understanding M2M to IoT.
CO 3	Apply IoT Architecture.
CO 4	Evaluate IoT Applications.
CO 5	Implement IoT Privacy, Security and Governance.
Pre-requisites	Basic Knowledge about IOT

Knowledge Levels			
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing			
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)			
COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	2
CO 2	2	PO 4	3
		PO 5	3
		PO 6	3
CO 3	2	PO 7	2
CO 4	3		
CO 5	2		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	1	1	1	2
CO2	2	3	3	2	2	2	1
CO3	2	3	3	2	2	2	1
CO4	1	2	2	3	3	3	2
CO5	2	3	3	2	2	2	1

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations
Indirect
1. Course End Delivery

Content of the Syllabus

Unit - I	Introduction	Periods	12
	IoT& Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoTRelated Standardization, Recommendations on ResearchTopics.		
Unit - II	M2M to IoT	Periods	12
	A Basic Perspective- Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview- Building an architecture, Main design principles and needed capabilities, An IoT architectureoutline, standards considerations.		
Unit - III	IoT Architecture	Periods	12
	State of the Art - Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevantarchitectural views		
Unit - IV	IoT applications for industry	Periods	12
	Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management,eHealth.		
Unit - V	Internet of Things Privacy, Security and Governance	Periods	12
	Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy andTrust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. DataAggregation for the IoT in Smart Cities, Security		
Total Periods			60

Text Books

1	Vijay Madiseti and ArshdeepBahga, Internet of Things: A Hands-on Approach –, Universities Press -INDIA Private Limited 2014, 1st Edition.
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References

1	Michael Miller, The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World–, Pearson Education2015
2	Francis da Costa, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications 2013, 1stEdition
3	WaltenegusDargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks: Theory and Practice, Wiley 2014.
4	CunoPfister, Getting Started with the Internet of Things, OReilly Media 2011.

E-References

1	https://github.com/connectIoT/iottool
2	kit 2. https://www.arduino.cc/
3	https://www.zettajs.org/

NMEC-NON MAJOR ELECTIVE COURSES

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								
Programme	B.Sc	Programme Code	UDS		Regulations	2022-2023			
Department	Data Science		Semester		3				
Course Code	Course Name	Periods per Week		Credit	Maximum Marks				
		L	T		P	C	CA	ESE	Total
22U3DSN01	COMPUTER APPLICATIONS FOR AUTOMATION		2	0	0	2	25	75	100
COURSE OBJECTIVES	To acquire knowledge on editor, spread sheet, slide preparation and To improve creative thinking in presentation software.								
POs	PROGRAMME OUTCOME								
PO 1	Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.								
PO 2	Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.								
PO 3	Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science								
PO 4	Communicate the subject effectively.								
PO 5	Understand professional, ethical, and social responsibilities.								
PO 6	Ability to understand and analyse a given real-time problems and propose feasible computing solutions.								
PO 7	Imbibe Quality Software Development practices.								

COs	COURSE OUTCOME
CO 1	Remember the basics of computers.
CO 2	Understand MS word.
CO 3	Demonstrate the functions of MS excel.
CO 4	Study the basics of MS power point.
CO 5	Analyze data processing with MS Access.
Pre-requisites	Basic computer knowledge

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)



COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	3
		PO 5	3
		PO 6	4
CO 3	3	PO 7	4
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	2	2	1	1
CO3	1	2	3	3	3	2	2
CO4	1	1	2	2	2	3	1
CO5	1	1	1	1	1	2	2

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction to Computers:	Periods	5
	Introduction- Importance- History-Anatomy		
	MS-Word	Periods	5
Unit - II	Basics -Dos and Donts - Menus - Commands -ToolBars - Icons - Word Formatting Tool Bar		
	MS-Excel	Periods	5
Unit - III	Basics - Dos and Donts - Menus - Commands ToolBars - Icons		
	MS-PowerPoint	Periods	5
Unit - IV	Basics - Menus - Tool Bars - Navigation		
	MS-Access	Periods	5
Unit - V	Introduction - Parts of an Window: - Creating a NewData Base - Table Wizard - Renaming - Saving theDatabase -Relationships - Query - Form - Reports -Exiting MS-Access		
	Total Periods		25

Text Books	
1	Sanjay Saxena, •MS-Office 2000 for everyone, Vikas Publishing House Pvt. Ltd, Reprint
References	
1	Nellai Kannan, •MS-Office, Nels Publications, 3 rd Edition, 2004.
2	John Walkenbach, Herb Tyson, Michael R.Groh, Faithe Wempen and Lisa A.Bucki , •" Microsoft Office 2010 Bible •, Wiley India Pvt. Ltd , Reprint 2010
E-References	
1	https://ptgmedia.pearsoncmg.com/images/9780735623026/sampl epag es/9780735623026.pdf
2	https://www.dit.ie/media / ittraining/msoffice/MOAC_Excel_2016_Core. pdf
3	https://ptgmedia.pearsoncmg.com/images/9780735697799/sampl epag es/9780735697799.pdf 2010

	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)										
Programme		B.Sc	Programme Code		UDS			Regulations		2022-2023	
Department		Data Science			Semester				4		
Course Code		Course Name			Periods per Week		Credit		Maximum Marks		
22U4DSN02		BASICS OF INTERNET			L	T	P	C	CA	ESE	Total
22U4DSN02		BASICS OF INTERNET			2	0	0	2	25	75	100
COURSE		To improve the skills of surfing internet and To prepare the students for developing webpage using HTML.									
OBJECTIVES		PROGRAMME OUTCOME									
PO 1		Understand and apply fundamental principles, concepts and methods in critical areas science and multidisciplinary fields.									
PO 2		Demonstrate problem-solving, analytical and logical skills to provide solutions for scientific requirements.									
PO 3		Develop critical thinking with scientific temper and apply the technologies in various fields of Data Science									
PO 4		Communicate the subject effectively.									
PO 5		Understand professional, ethical, and social responsibilities.									
PO 6		Ability to understand and analyse a given real-time problems and propose feasible computing solutions.									
PO 7		Imbibe Quality Software Development practices.									

COs	COURSE OUTCOME
CO 1	Remember the basics of Internet.
CO 2	Understand internet technologies.
CO 3	Demonstrate tags in HTML.
CO 4	Study the basics of create list and tables.
CO 5	Analyze frames and forms.
Pre-requisites	Basic knowledge about computers

Knowledge Levels

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

CO / PO / KL Mapping

(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)

COs	KLs	POs	KLs
CO 1	1	PO 1	1
		PO 2	2
		PO 3	3
CO 2	2	PO 4	3
		PO 5	4
		PO 6	3
CO 3	3	PO 7	3
CO 4	4		
CO 5	5		

COs	Programme Outcome (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	1	1	1	1
CO2	2	3	2	2	1	2	2
CO3	1	2	3	3	2	3	1
CO4	1	1	2	2	3	2	2
CO5	1	1	1	1	2	1	1

Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & Model 2. Assignment 3. End Semester Examinations	
Indirect	
1. Course End Delivery	

Content of the Syllabus			
Unit - I	Introduction To The Internet	Periods	5
	Computer in Business - Networking - Internet -E-mail - Resource Sharing - Gopher -World Wide Web - Telnet - Bulletin Board Service - Wide Area Information Service.		
Unit - II	Internet Technologies	Periods	5
	Modem - Internet addressing - Physicalconnections - Telephone Lines - Internet browsers - Internet Explorer - Netscape Navigator.		
Unit - III	Introduction to HTML	Periods	5
	Designing a home page - HTMLdocuments - Anchor tag - Hyper Links. Traditional text and formatting		
Unit - IV	Types of lists	Periods	5
	Ordered, Unordered - Nesting Lists - Other tags: Marquee, HR, BR- Using Images - Creating Hyperlinks, Tables: Creating basic Table, Table elements, Caption - Table and cell alignment - Rowspan, Colspan - Cell padding		
Unit - V	Frames	Periods	5
	Frameset - Targeted Links - No frame - Forms : Input, Text area, Select, Option.		
Total Periods			25

Text Books	
1	C Xavier, "World Wide Web with HTML, Tata McGraw Hill Education, 2000.
2	H.M.Deital, P.J. Deital, "Internet and World Wide Web " How to Program, 4th Edition" PHI Learning
References	
1	Laura Lemay, "HTML Complete Reference, Teach Yourself Web Publishing with HTML
E-References	
1	https://www.codecademy.com/learn/learn-html/